Technics
by Panasonic

Direct Drive Automatic Turntable System

SL-1650

OPERATING INSTRUCTIONS

The model number of this product may be found on the back of the unit; and the serial number, on the label affixed to the bottom of the unit.

You should note the model and serial numbers of this unit in the space provided and retain this booklet as a permanent record of your purchase to aid identification in the event of theft.

MODEL NUMBER _____

SERIAL NUMBER _____

Before operating this set, please read these instructions completely.

We want to thank you for selecting the SL-1650, Direct Dive Automatic Turntable System.
For optimum performance, we recommend that you read these instructions carefully.

Parts identifications

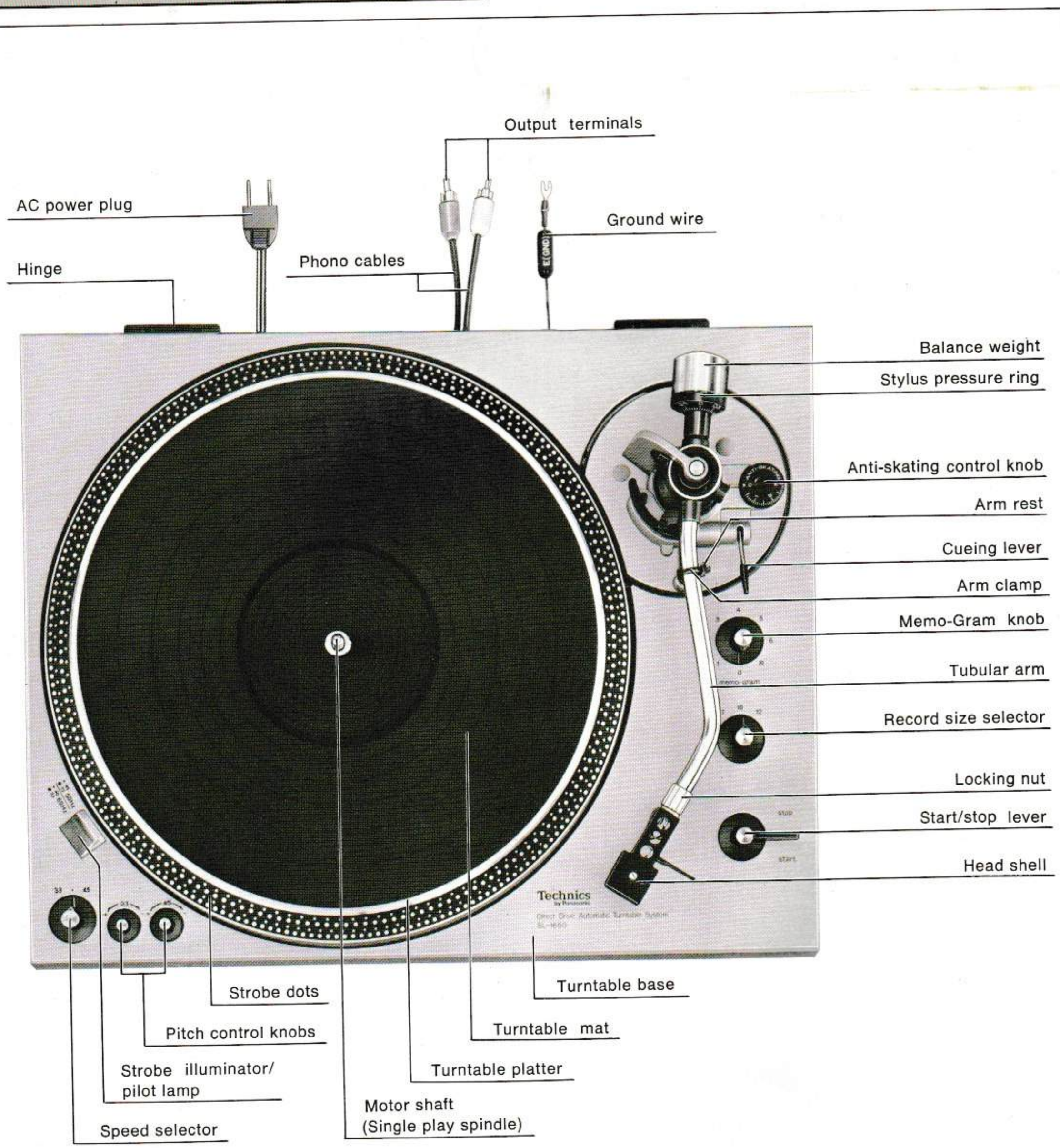


Fig. 1

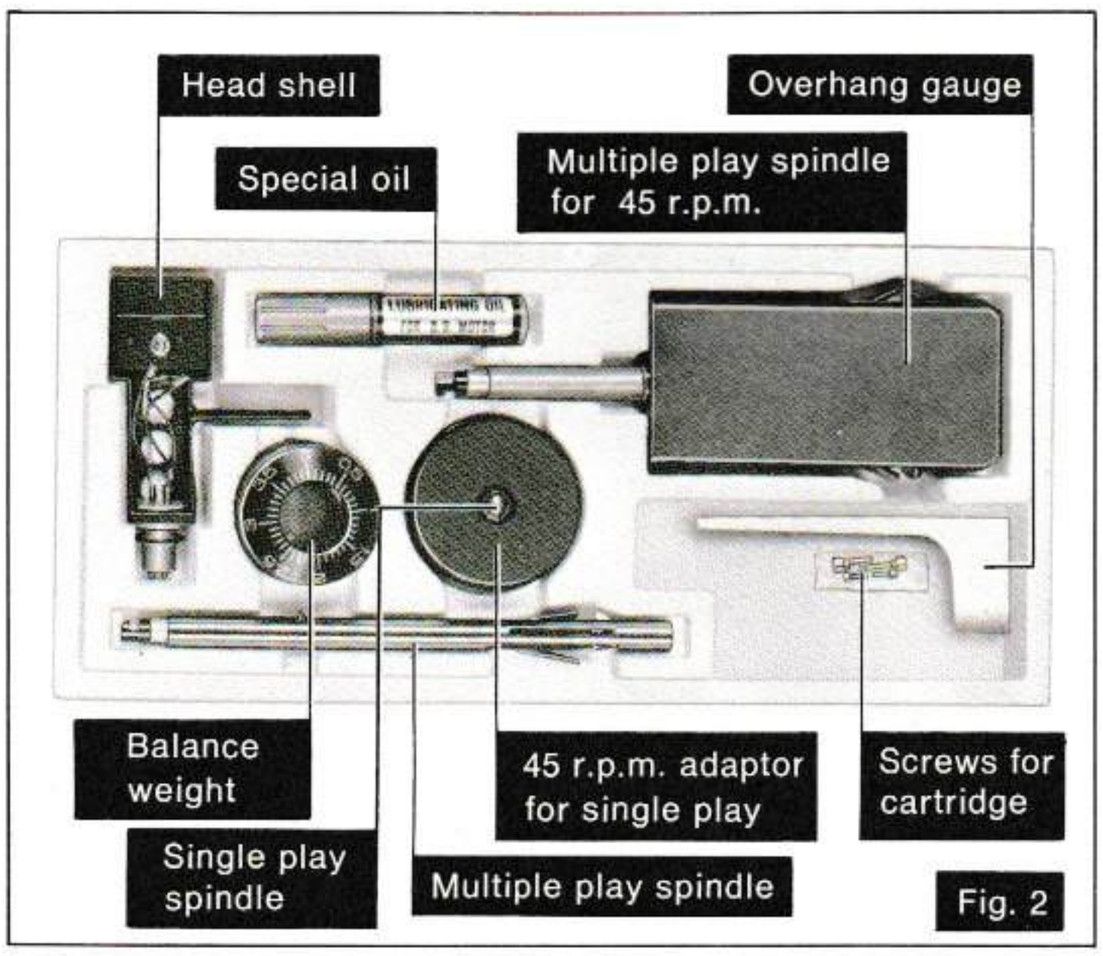
"Warning: To prevent fire or shock hazard, do not expose this appliance to rain or moisture."

Assembly and set-up

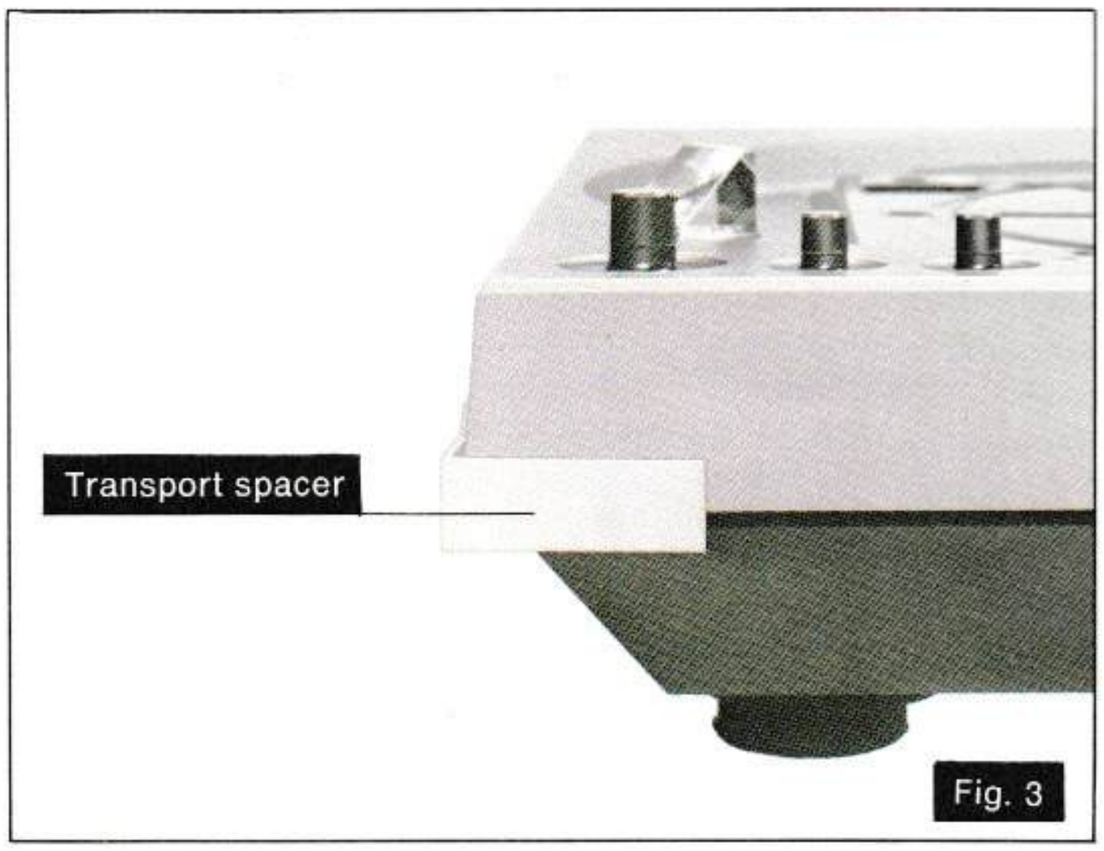
Caution:
Never connect the AC power plug before the assembly has been completed.
Attach the dust cover last, so that sasembly of other parts and adjustments can be made efficiently.

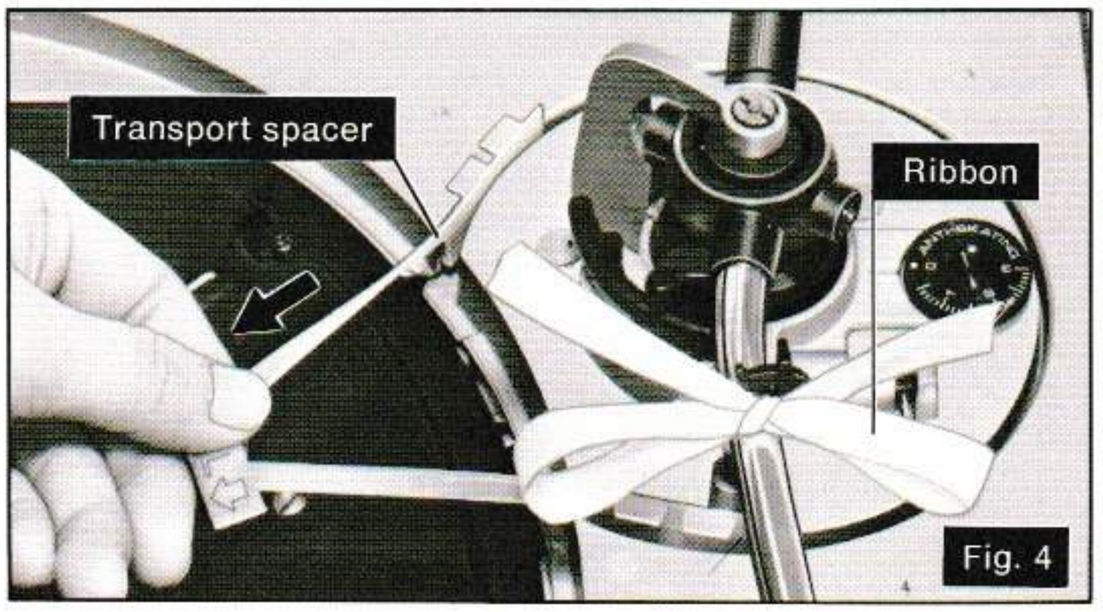
❶Check the parts. (See Fig. 2).

Turntable unit 1	45 r.p.m. adaptor
Turntable platter 1	(for multiple play) 1
Turntable mat 1	(for single play) 1
Dust cover 1	Special oil 1
Multiple play spindle 1	Balance weight 1
Single play spindle 1	Head shell 1
	Overhang gauge.....1
	Screws for cartridge 4



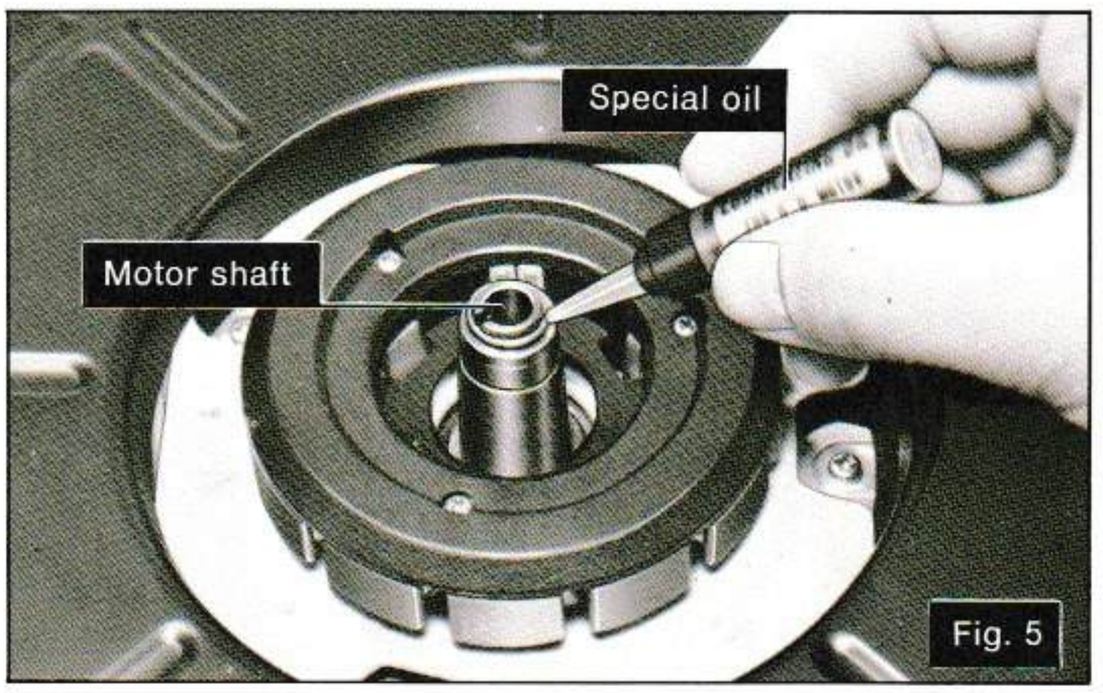
❷Remove the transport spacers.
Remove 3 spacers for transportation (located at left-hand front corner, right-hand rear corner, and then the tonearm base), and the tape fastening the tonearm. (See Figs. 3 and 4).





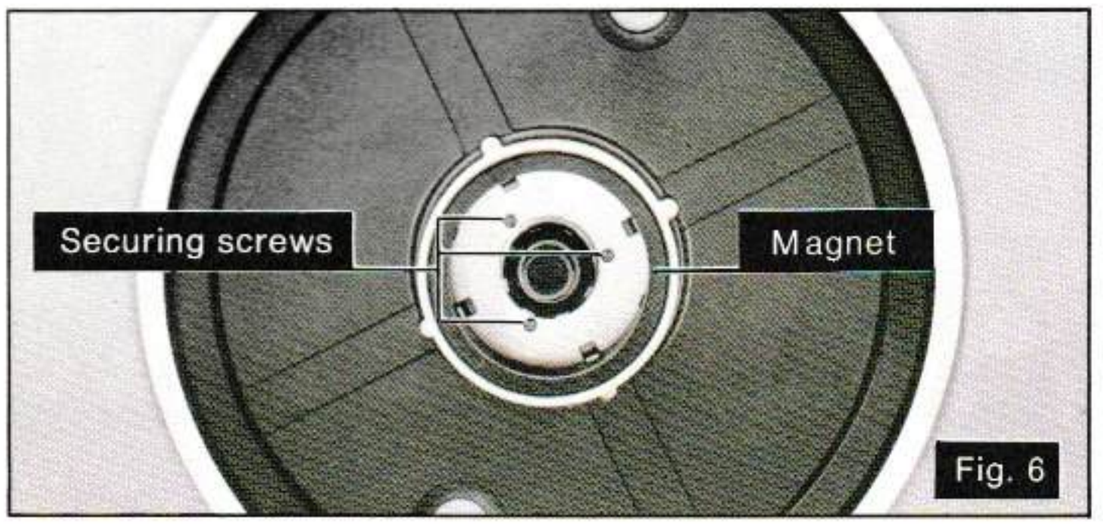
Note:
Pull this spacer in direction of arrow after removing further two spacers at the rear right and front left of the turntable base.

❸Apply two or three drops of oil to the motor shaft using the furnished oil container. (See Fig. 5).
Although the unit has been lubricated before shipping from the factory, apply a few drops of oil to the motor shaft for assurance. After that, application of two or three drops of oil once every 2000 hours' operation or so is sufficient. The time interval is much longer than that of conventional type motors (200–500 hours), so do not apply too much oil, nor more frequently than necessary. Never use any other type of oil.



❹Installation of the turntable platter.
① Place the turntable platter on the motor shaft (center spindle).
② Place the turntable mat on the platter.

Note:
1) The rotor is connected to the reverse surface of the turntable platter. (The magnet of the motor is attached to the turntable platter). To maintain optimum performance as specified, extra care should be taken to prevent adhesion of dust or iron filings to the magnet and not to damage the magnet by dropping it.
2) Do not remove the three screws for securing the magnet. (See Fig. 6).
Should the position of the fixed magnet be altered by loosening the securing screws, the rated performance of the unit can not be guaranteed.



❺Installation of the cartridge (optional).

In order to use the unit in a more ideal condition, please refer to the following when installing the cartridge.

- Most of the world's famous cartridges are designed in their heights (H) in the region of 15 to 20 mm. Fig. 7 shows the angle of vertical tracking error of the height (H) from the cartridge installing surface to the stylus tip and the number of records when the furnished head shell.
- This unit is so designed that the error angle reaches exactly 0 when 3 records are placed one upon another.
- Since the tonearm of this unit has a long effective length amounting to 230 mm (9-1/16''), with vertical tracking error angle within 2°, the unit is free from any influence due to strain.

Vertical tracking error

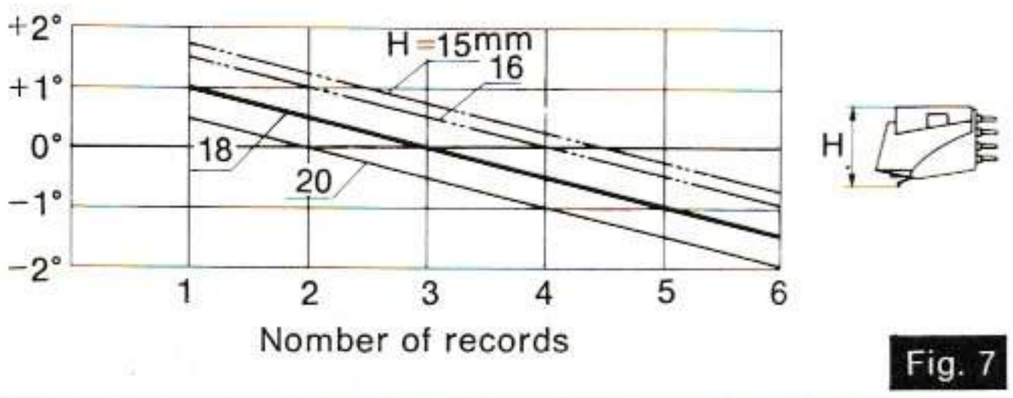


Fig. 7

① Connect the lead wires to the cartridge terminals.

White (L +).....:Left channel +
Blue (L −) .....Left channel −
Red (R +) .....Right channel +
Green (R −) .....Right channel −

② Install the cartridge to the spacer, and tighten it with screws provided with the cartridge. (See Fig. 8).

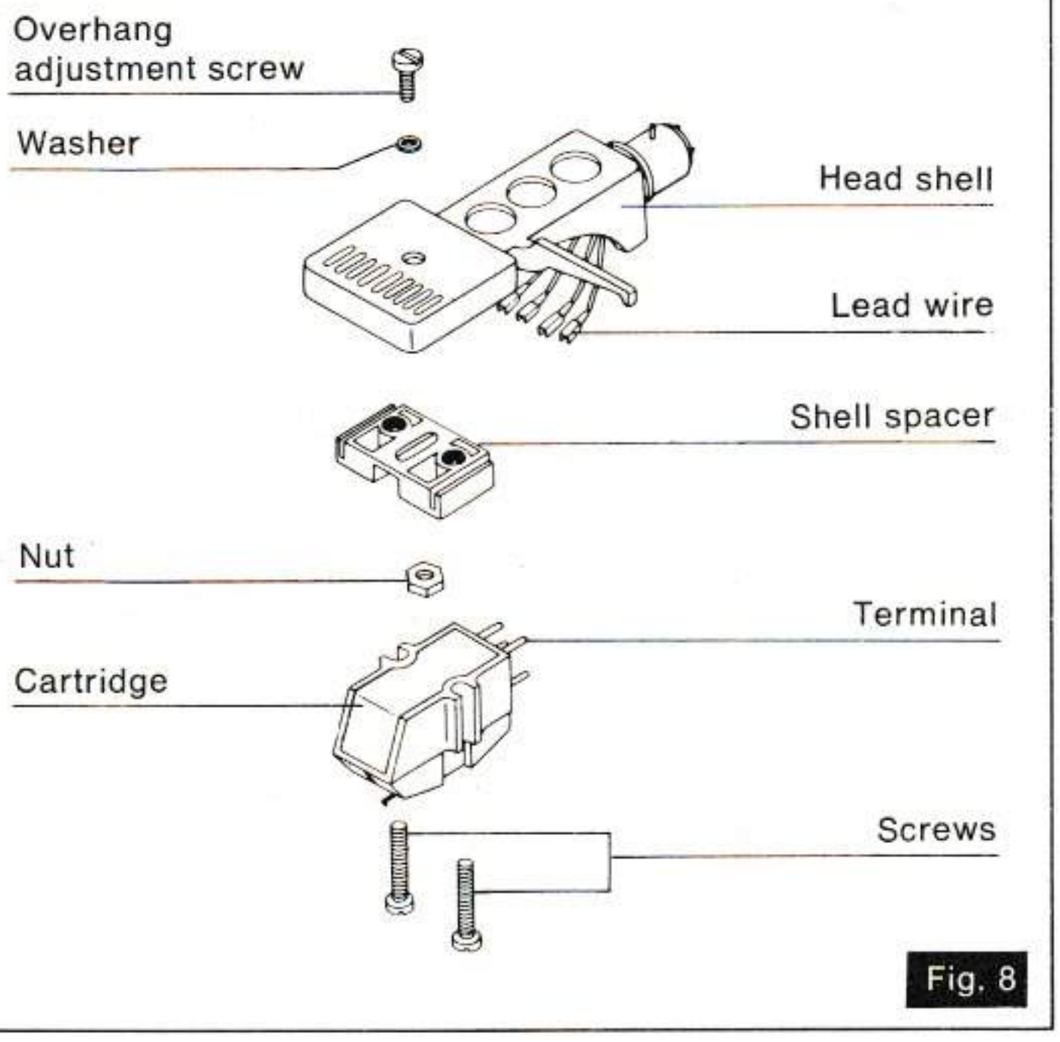


Fig. 8

③ Insert the head shell into the gauge. (See Fig. 9).

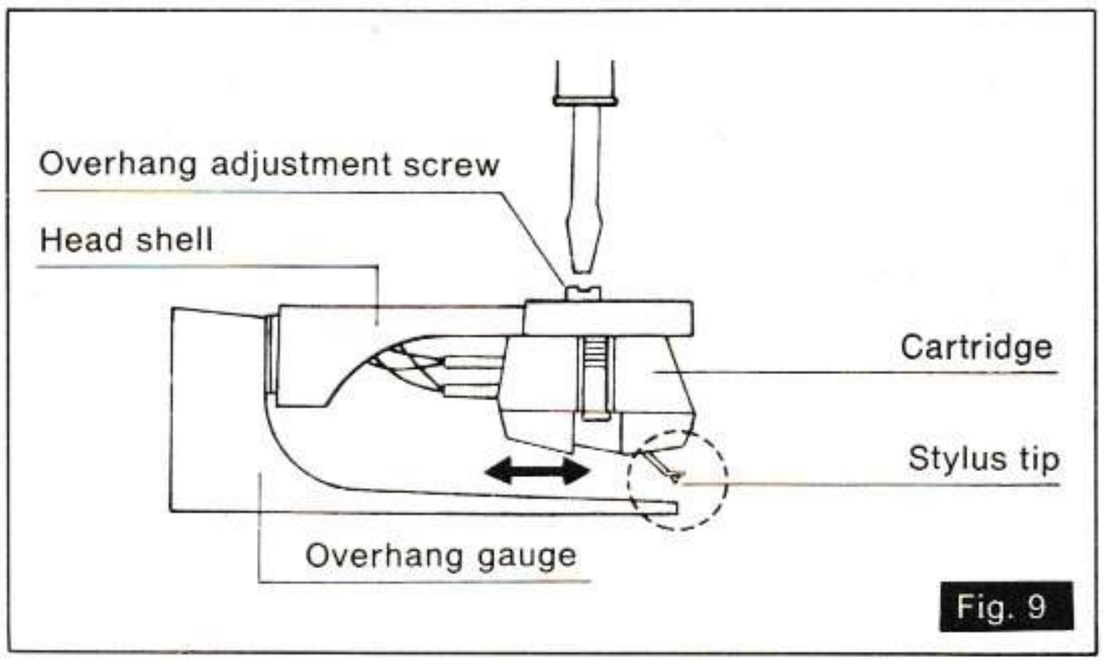


Fig. 9

④ Loosen overhang adjustment screw and move the cartridge forward or backward until the stylus tip lines up with the edge of the gauge.

⑤ Tighten adjustment screw without moving the cartrigde.

Note:

1) Your cartridge is now adjusted for lowest traching error and minimum distortion.
2) This gauge is exclusively designed for this tonearm.

❻Installation of the head shell. (See Fig. 10).

Insert the plug portion of the head shell into the front end of the tubular arm, and turn the locking nut clockwise (in the direction shown by the arrow "A"), with the head shell held horizontally to secure firmly.

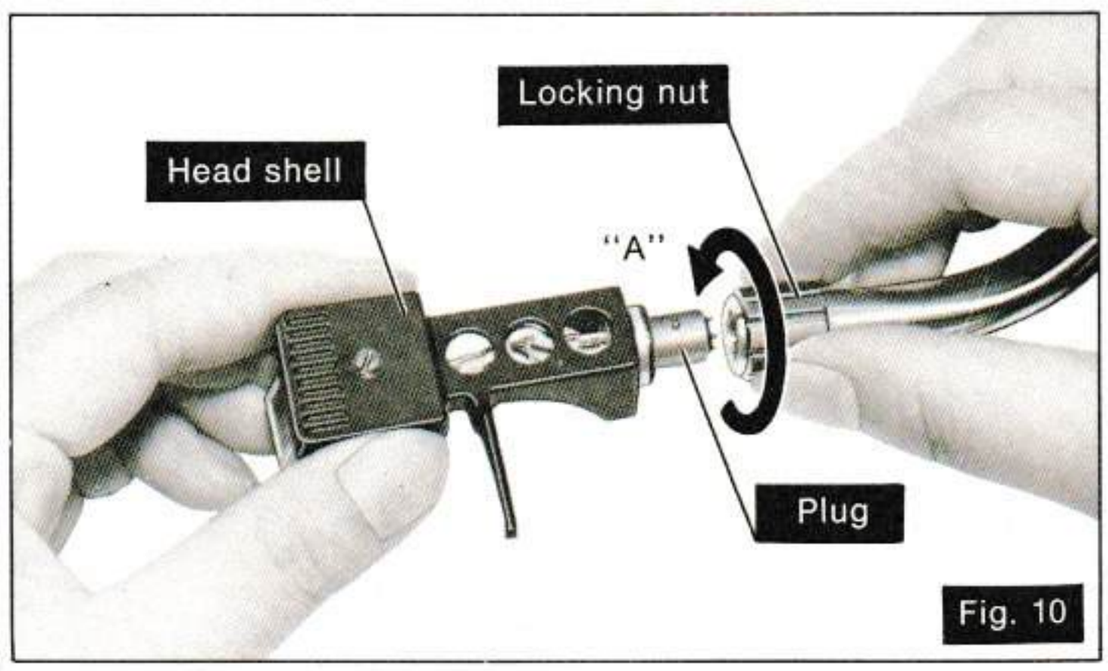


Fig. 10

❼Adjustments of the horizontal "0" balance and the stylus pressure.

Note:

Before adjusting the horizontal "0" balance, confirm following items.

1) Make sure that the cueing lever is in the lowered position as shown in Fig. 14.
2) Make sure that the speed selector is in the " • " position, the balance adjustment is easily made as the turntable platter remains stationary. (See Fig. 1).
3) Make sure that the anti-skating knob is at "0" position. (See Fig. 11).
   There are cases where the tonearm may sway or flow slightly at the position of "0" due to the highly sensitive rotational part of the tonearm, but this side force is trivial and presents no inconvenience.
4) Make sure that the "memo-gram" knob is located at the "0" position. (See Fig. 1).

① Insert the balance weight onto the rear shaft of the tonearm. (See Fig. 11).
② Remove the stylus cover, if your cartridge has one.
③ Release the arm clamp (See Fig. 12) and lift the tonearm from the arm rest to free the tonearm. (See Fig. 13).

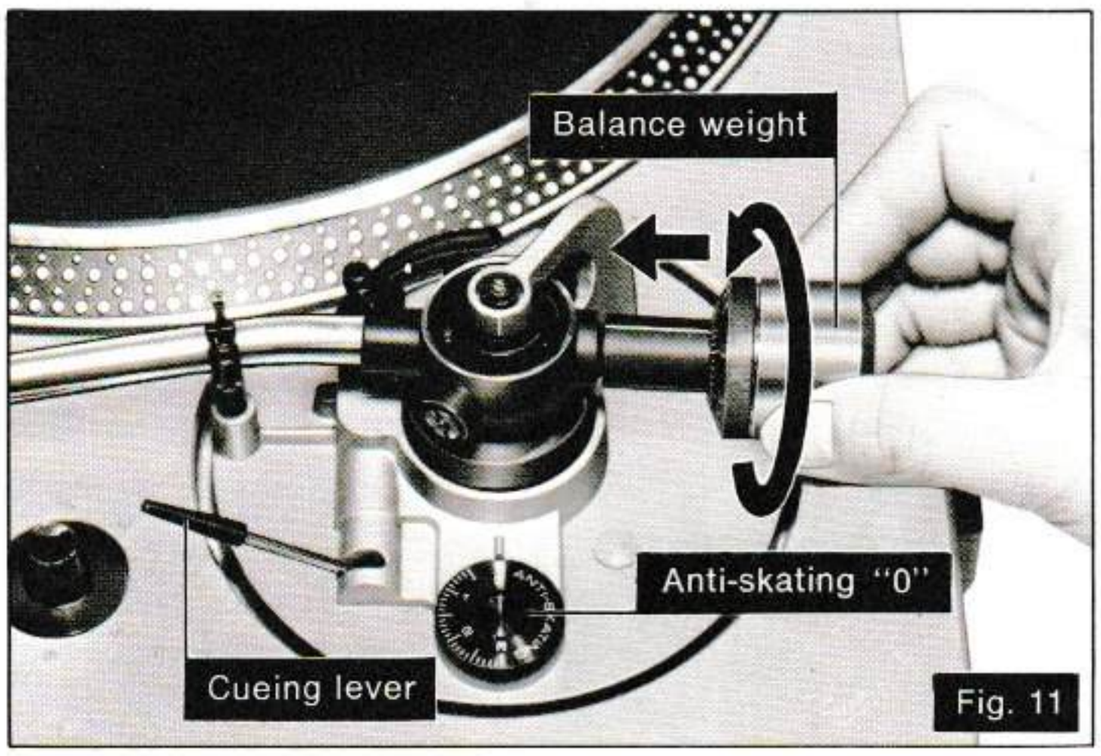


Fig. 11

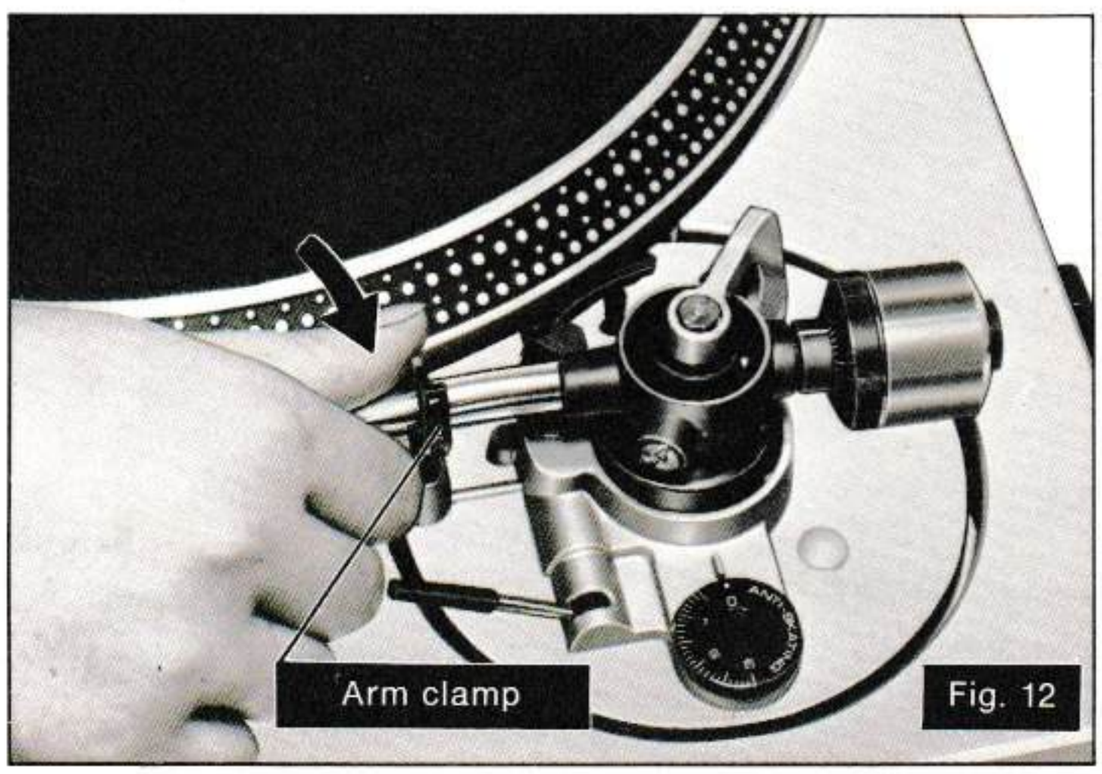


Fig. 12

Fig. 13

Note:
If the tonearm is urged to return to the arm rest when the tonearm is held in a free state as in Fig. 13, rotate the turntable platter clockwise about 10 times. This is necessary because in rare cases the automatic mechanism may have engaged the tonearm gear or moved out of its normal position during transportation.

④ Turn the entire balance weight clockwise (indicated by the arrow "A") or counterclockwise (indicated by the arrow "B") until the tonearm is approximately balanced horizontally. (See Fig. 14).

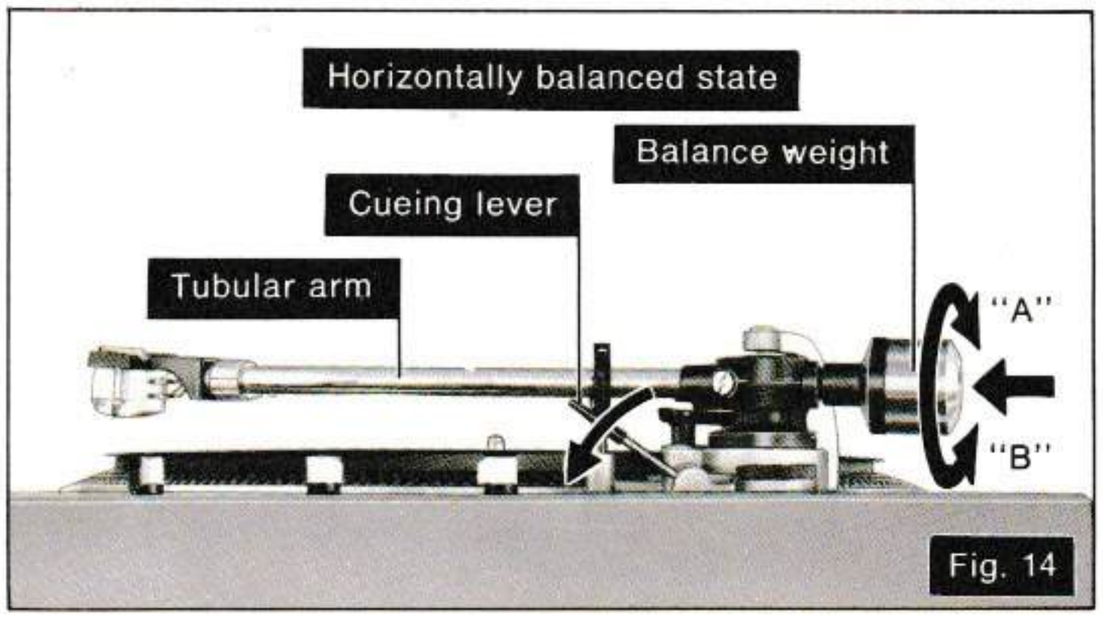


Fig. 14

Note:
During the adjustment of the horizontal balance, be sure that the stylus tip of the cartridge does not contact the turntable mat or turntable base.

⑤ After the tonearm is horizontally balanced, temporarily fix the tonearm by the arm clamp. (See Fig. 15).
Hold the balance weight stationary with fingers as shown in Fig. 15 and rotate only the stylus pressure ring to bring the numeral "0" of the ring into alignment with the center line on the tonearm rear shaft. (The adjustment of the horizontal balance is now completed.)

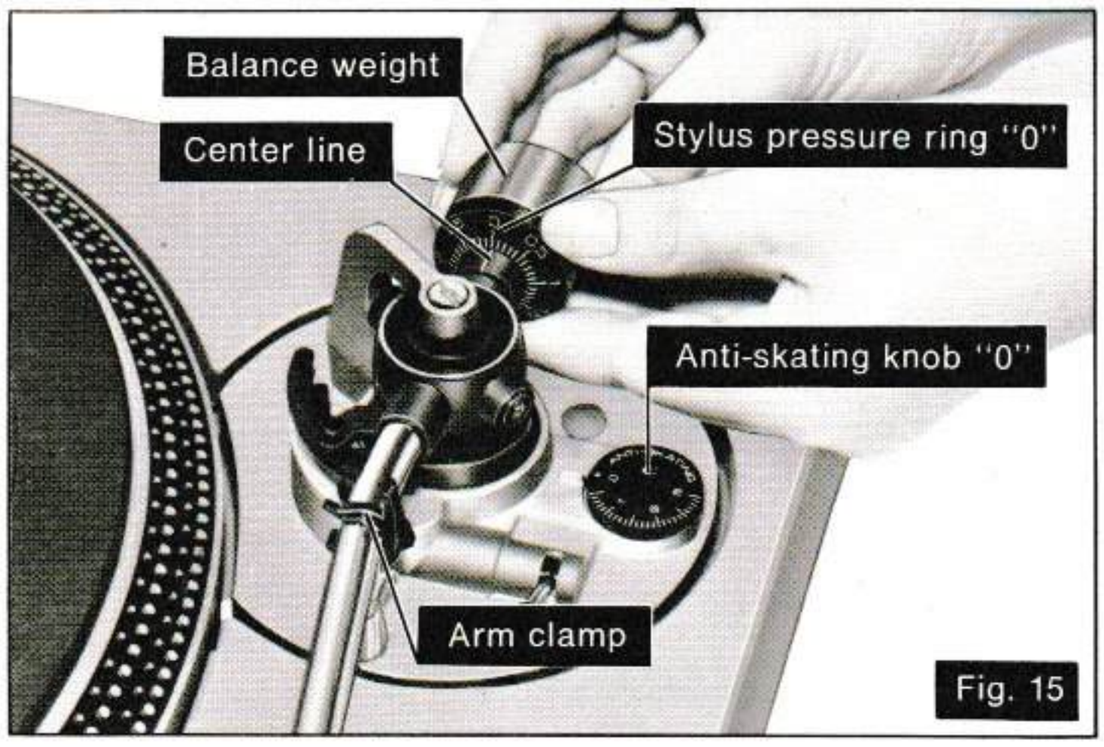


Fig. 15

⑥ After adjusting the horizontal balance, turn the balance weight clockwise in the direction of the arrow and align the correct stylus pressure. (Follow the cartridge manufacturer's recommendation.) (See Fig. 16).

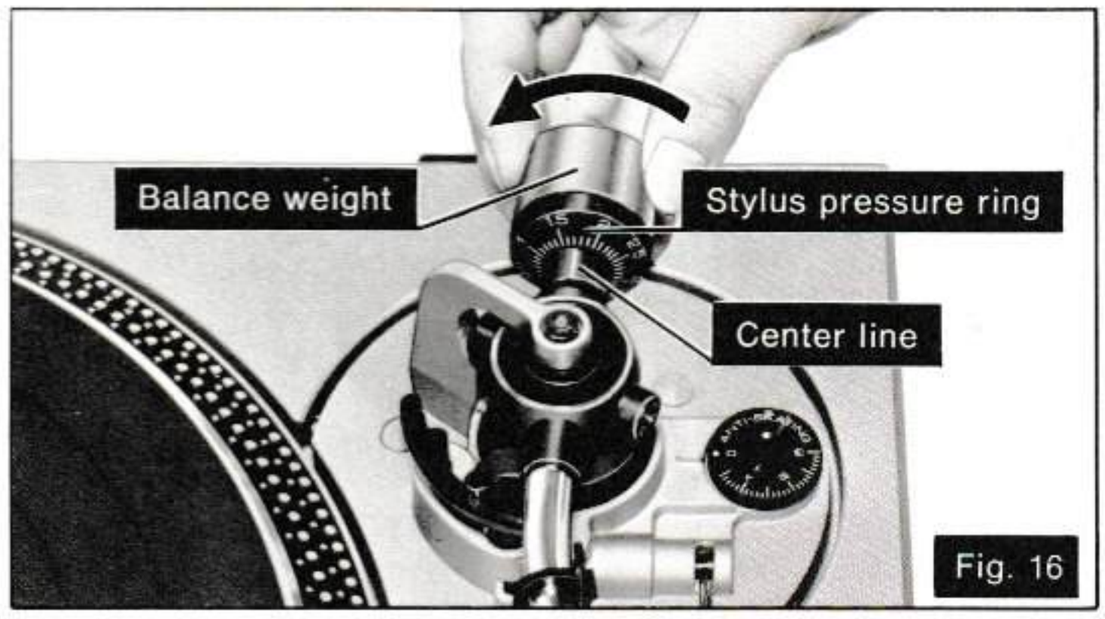


Fig. 16

Note:
1) As the stylus pressure ring rotates together with the balance weight, proper stylus pressure can be selected by directly reading the graduated ring.
2) Set the stylus pressure to the maximum value of your cartridge in cases where the record has an extremely high recording level, or where the unit is operated in a room at low temperature or in places in which the unit is liable to be subjected to vibrations.

❽Anti-skating force control.
Set the anti-skating force control to the same value as that set for stylus pressure. (See Fig. 17).

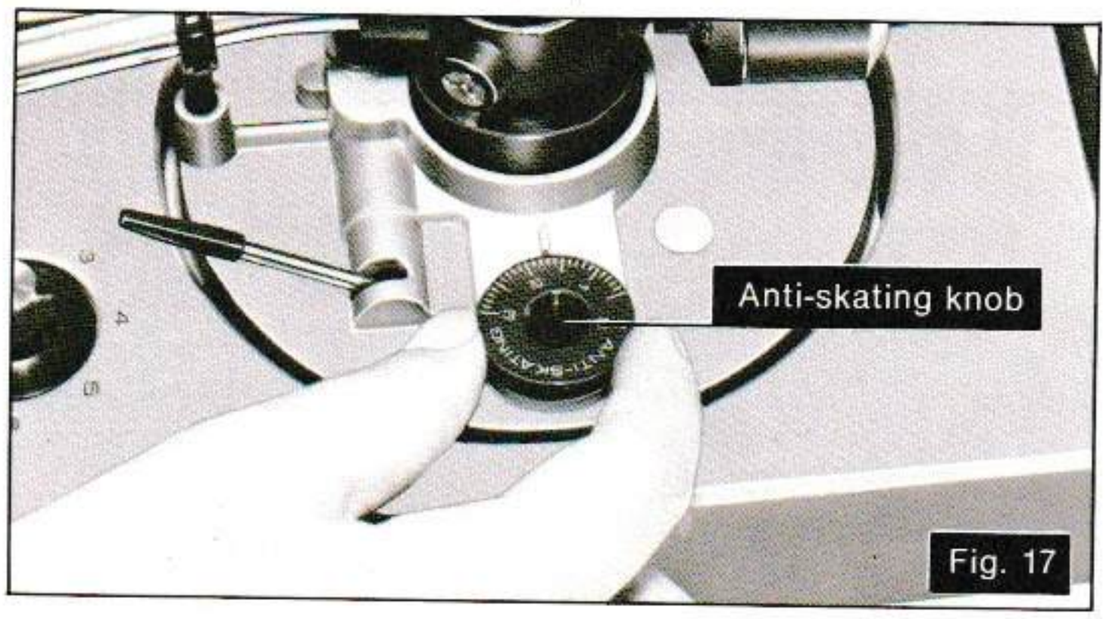


Fig. 17

❾Installation of the dust cover. (See Fig. 18).
Place the dust cover into position from directly above, holding it at both sides. For detaching the dust cover, be certain first to raise it as illustrated before removal.
Note:
Opening or closing of the dust cover during playing should be made as gently as possible, since this may not only cause harmful vibrations, but also result in skipping of the stylus.

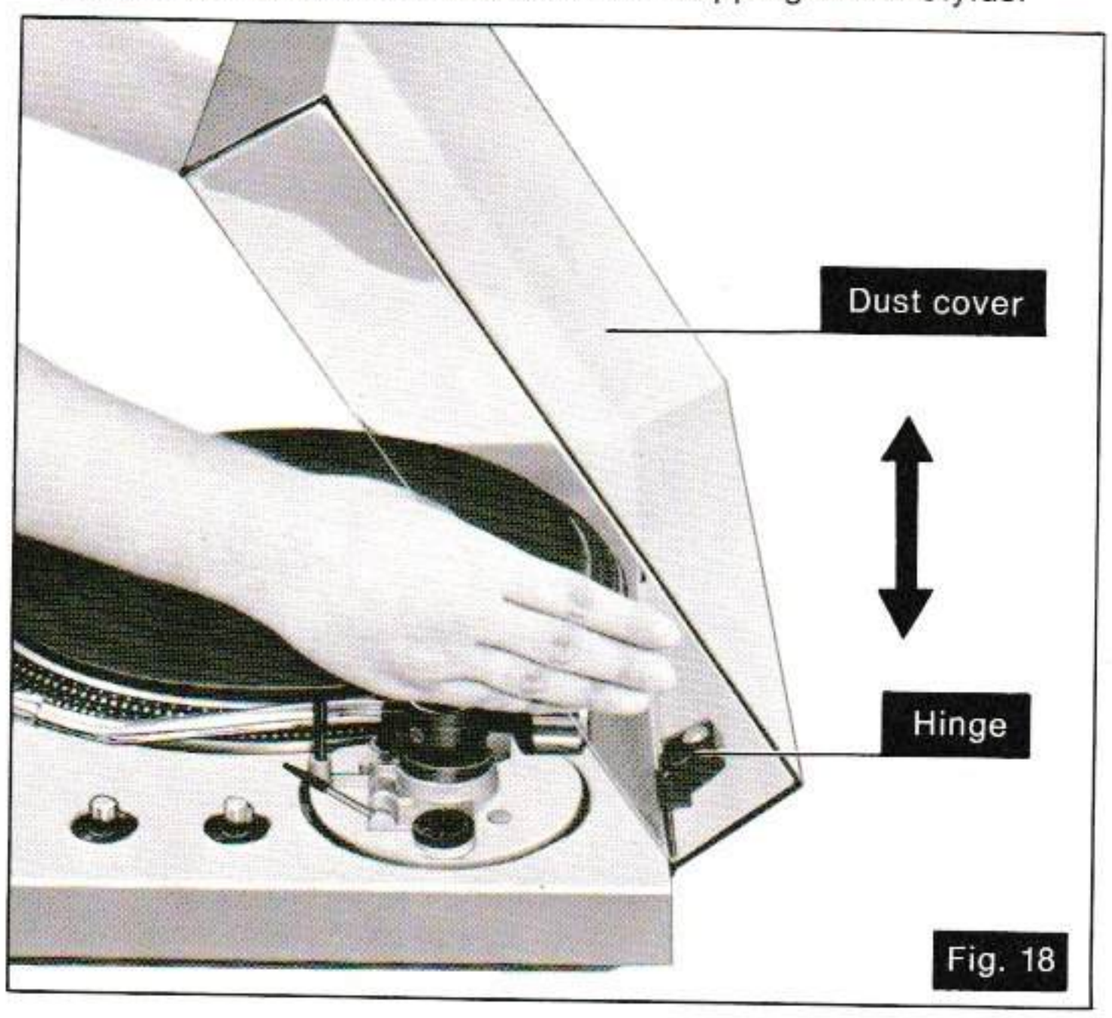


Fig. 18

❿Placement.
1. Use the unit in a stable and horizontal position, where there is little or no vibration.
2. Use the unit as far away from the speakers as possible and isolate the unit from sound radiation from them.
3. Do not place the unit where it is exposed to direct sun, dust, moisture or heat.
4. Keep it in a well-ventilated place.

⓫Connect the AC power plug.
Connect the AC power plug to the AC socket.
In cases where the AC power plug is connected to the outlet (AC outlet) of the amplifier, receiver and the like, make sure that the wattage indicated on the outlet corresponds to the turntable's requirements before conncting the power plug.

⓬Connect the output terminals.

Output terminals		Amplifier or Receiver
L (White)	→	**L** Channel
R (Red)	→	**R** Channel
E (Spade lug)	→	**GND**

Note:
Be sure to connect the ground terminal to the amplifier or receiver. If this connection is not made or is loose, a power source "HUM" will result.

How to play

Ensure the following items before starting to play.
- Check whether the arm clamp is realesed.
- Make sure whether the "memo-gram" knob and other knobs are set in correct positions.
- Make sure that the stylus cover is removed, if your cartridge has one.
- See if the stylus pressure is correctly adjusted.

Single play

Manual play of a record

❶Install the single play spindle to the motor shaft. (See Fig. 19).

Fig. 19

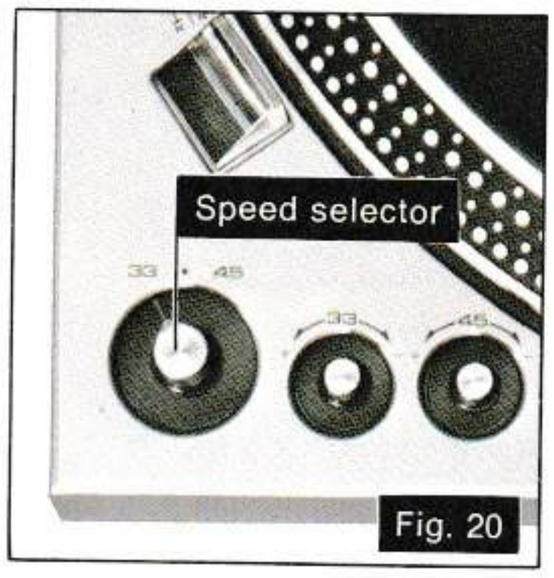


Fig. 20

❷Set the speed selector to the desired record speed. (See Fig. 20).

❸Make sure that the "memo-gram" knob is located at the "0" position. (See Fig. 21).

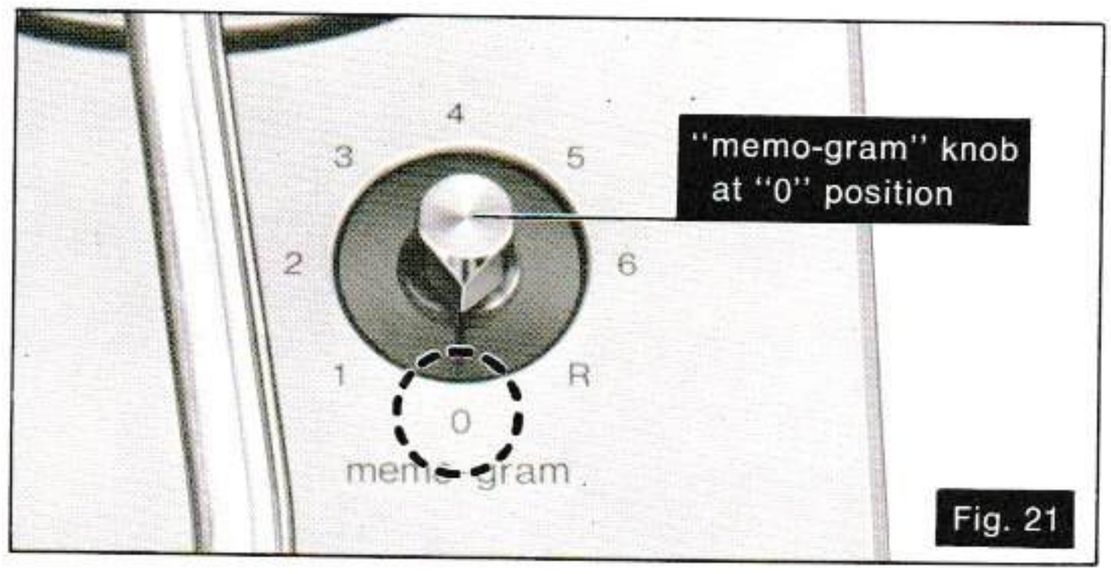


Fig. 21

❹Release the arm clamp and lift the cueing lever. (See Fig. 22).

Fig. 22

❺Move the tonearm over the record and then lower the cueing lever. The tonearm will descend slowly onto the record and play will begin.

❻When finished playing, the tonearm will automatically return to the arm rest (auto-return) with the power shut off, and the turntable platter will stop rotation.
(The turntable platter will rotate for a short time due to its inertia.)

- When the tonearm is moved towards the record, the power is turned on and the turntable platter will start rotating. If the speed selector is positioned at " • ", the turntable platter will not rotate, although e strobe illuminator is lit.
- For temporary suspension of playing, raise the cueing lever, and the stylus tip of the cartridge will be raised from the record.
- If you want to suspend playing, push the start/stop lever toward the "stop" position. The tonearm automatically returns to the arm rest, with the power supply shut off, and the turntable stops rotating.

Note:

1) In case where the "memo-gram" knob is located in positions other than "0", playing will be repeated by the number of times set, and therefore, be sure to keep the "memo-gram" knob located at the "0" position. (Refer to Fig. 21).
2) The "memo-gram" knob may be turned either clockwise or counterclockwise without any inconveniences, but care should be taken not to touch it when the tonearm is in movements for automatic start, autmatic return, etc.
3) Records having dimensions other than 7" (17 cm), 10" (25 cm) and 12" (30 cm) diameter of the record should be played by "Manual" playing.

Automatic play of a record

❶Set the speed selector knob in the same manner as in manual play and release the arm clamp.

❷Set the record size selector knob to the diameter of the record (7" (17 cm), 10" (25 cm) or 12" (30 cm)) you wish to play. (See Fig. 23).

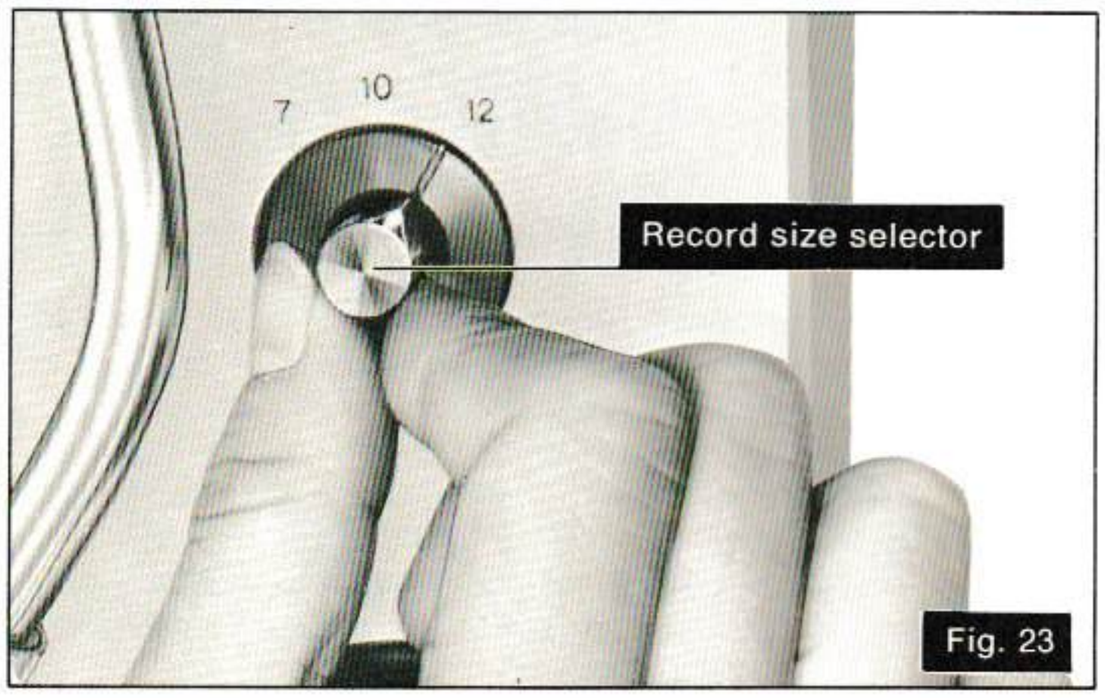


Fig. 23

❸Make sure that the "memo-gram" knob is located at the "0" position. (See Fig. 21).

❹Pull the start/stop lever toawrd the "start" position. The tonearm will then move according to the set record size to start playing. (Auto-start).

❺When finished playing, the tonearm will automatically return to the arm rest (auto-return) with the power shut off, and the turntable platter will stop rotation.

If you want to suspend playing, push the start/stop lever toward the "stop" position. The tonearm automatically returns to the arm rest, with the power supply shut off, and the turntable stops rotating.

Repeat play of a record

This unit is equipped with a convenient mechanism of the "memo-gram".
You can play the record repeatedly from one to six times or continuously by setting this knob to the desired position.
Set the "memo-gram" knob to the desired number you wish to play. (See Fig. 24).

Note:
For suspending playing, be sure to push the start/stop lever toward "stop" position after having set the "memo-gram" knob to "0".

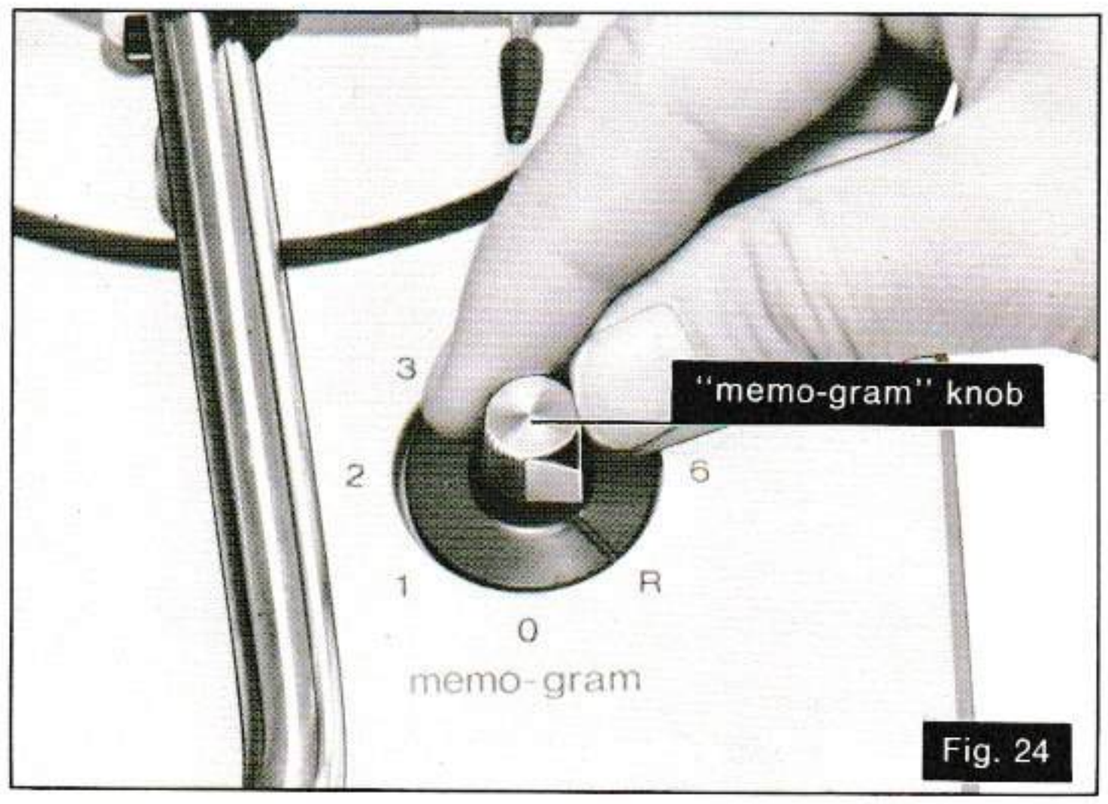


Fig. 24

"R" position enables you to repeat playing continuously.
Subsequently, follow the same procedures as for the automatic (auto-start) play.

Multiple play

Automatic play for up to 6 records

This unit employs a unique umbrella type of spindle which can stack as many as six records of the same size.
You can select the number of the records (or repeat play of the last record) with the "memo-gram" knob.

❶Insert the multiple play spindle, aligning the key on its base with the slot of the motor shaft. (See Figs. 25 and 26).
Then, rotate it clockwise pushing downward until it stops.

For pulling off, proceed in the reverse order. In this case, be sure to first remove the record from the multiple play spindle.

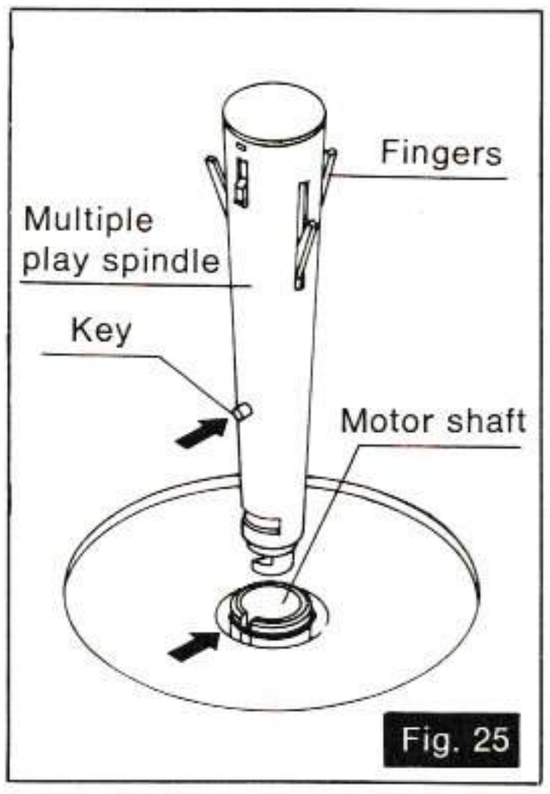


Fig. 25

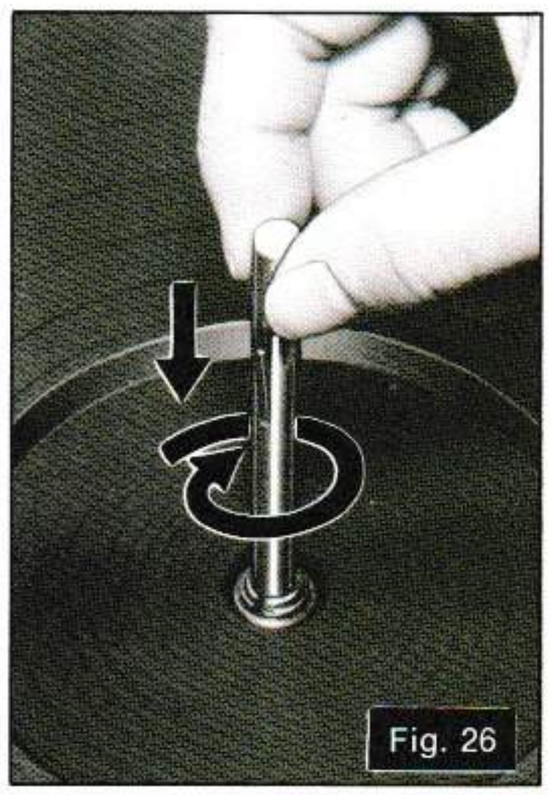


Fig. 26

Note:
When the automatic mechanism is in operation, never insert or withdraw the multiple play spindle.

❷Stack records of the same size on the fingers of the multiple play spindle.

❸**Count the number of records stacked, and set the "memo-gram" knob to the number corresponding to the records; i.e., when you stack three records, set the "memo-gram" knob to the "3" position.** (See Figs. 27 and 28).

Fig. 27

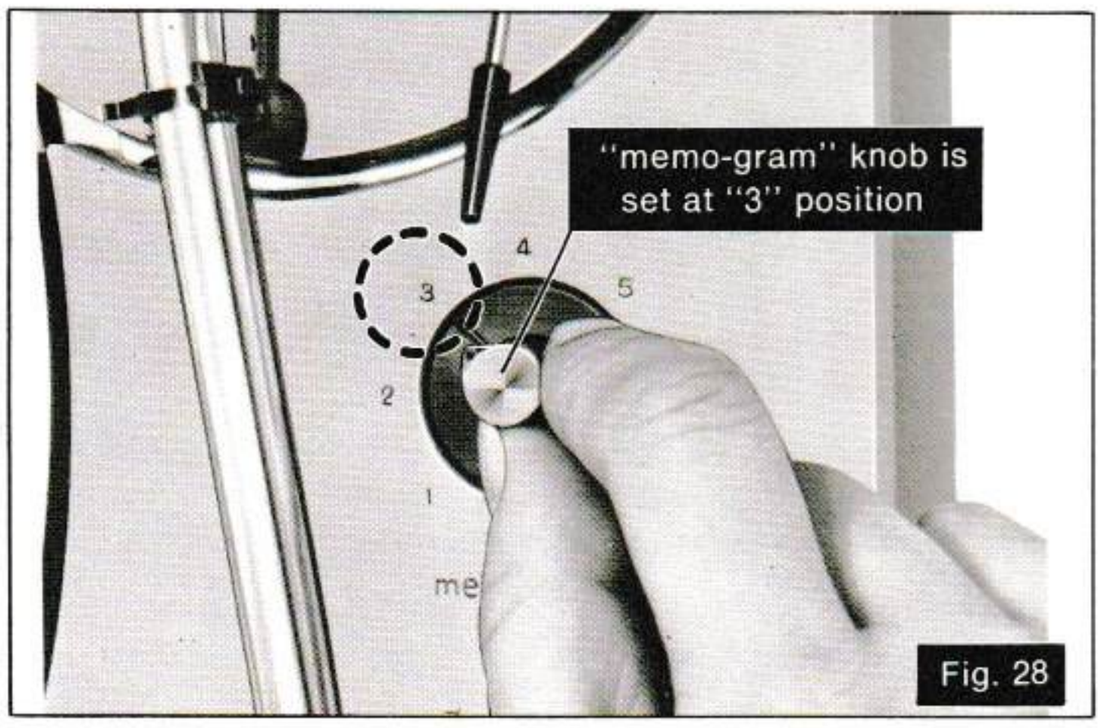


Fig. 28

❹**Make sure that the record size selector and speed selector are set to the proper position, and also lower the cueing lever.**
Subsequently, follow the same procedures as for the automatic (auto-start) play.
If you want to suspend playing, push the start/stop lever toward the "stop" position. The tonearm automatically returns to the arm rest, with the power supply shut off, and the turntable stops rotating.
In case, the succeeding record will be dropped, and therefore, set to the multiple play spindle for subsequently playing this record.

For multiple play plus repeat play
Set the "memo-gram" knob to the "R" position for multiple play, and you can play the last record repeatedly (repeat).

When you play a 45 r.p.m. record with a large center hole
- In the case of "single play", apply the 45 r.p.m. adaptor for the single play onto the single play spindle.
- In case of "multiple play", insert the 45 r.p.m. adaptor for the multiple play to the motor shaft, in the same manner as for multiple play spindle. (Refer to Figs. 25 and 26).

Note and Maintenance

❶**Records having sizes other than 7", 10" and 12" (17 cm, 25 cm and 30 cm) should be played manually.**
- This unit is adjusted based on the standard dimensions specified for records. Therefore, use the unit manually for playing records other than those specified by the standard.
- Additionally, in the case of multiple play, if warped records, records eccentric in the center of gravity, or those too thick of thin are used, there may be cases where the record inclines on the spindle, 2 records falls simultaneously or the record does not fall, but such inconveniences are not attributable to troubles in the unit.

❷**While the tonearm is in motion, never turn the "memo-gram" knob, and keep your hands away from the tonearm.**

❸**In the case of multiple play, be sure to use records of the same size.**

❹**Use the cueing lever only for the single play (playing of one record).**

❺**For using other head shells, be careful about the head shell configuration. (See Fig. 29).**
When you use other head shells having high handle portions, there may be cases where the handle portion of the head shell strikes against the inner upper surface of the record while the tonearm is in auto-start, auto-return motions. Meanwhile, in the case of the multiple play, the handle portion may strike against the record, and therefore, use of such a head shell should be avoided.

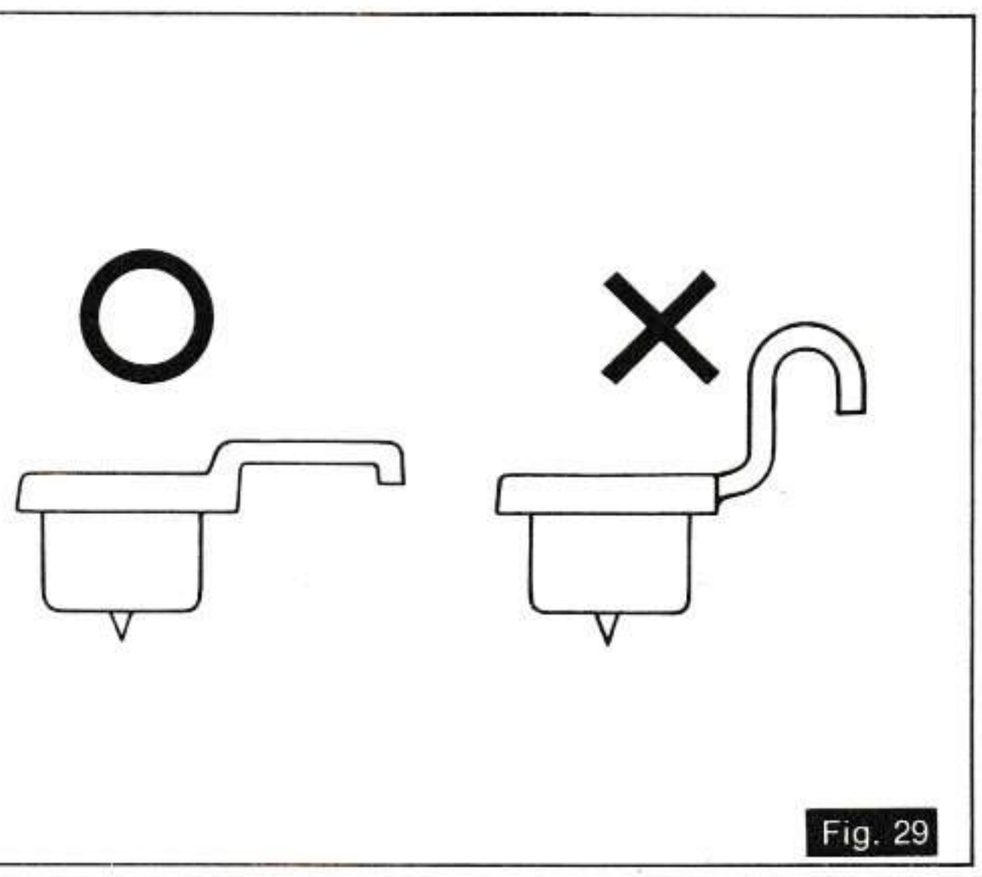


Fig. 29

❻**Dust and dirt adhering to the stylus tip or the record should be carefully removed.**
If used with dust and dirt adhering to the stylus tip, the stylus will not fit into the sound groove of the record correctly. This may not only result in the deterioration of tone quality, but cause undue wear of the record and the stylus tip itself.
Use a brush having soft tips, moving it from the base to the tip of the stylus carefully for removing dust and dirt.
The record should also be carefully wiped with a record cleaner of high quality.

❼**Before detaching or attaching the head shell, be sure to turn the volume control for the amplifier or receiver to "0" position, or to turn off the power.**
Detaching or attaching of the head shell, with the volume control turned high, may not only result in unpleasant noises, but cause damage to the speakers.

❽**Wipe the head shell terminals from time to time.** (See Fig. 30).
Adhesion of dust and dirt to the head shell terminals may give rise to contact faults, thus resulting in increased "HUM" noise or non transfer of sound to the speakers. Use a soft dry cloth or the like for wiping the head shell terminals.

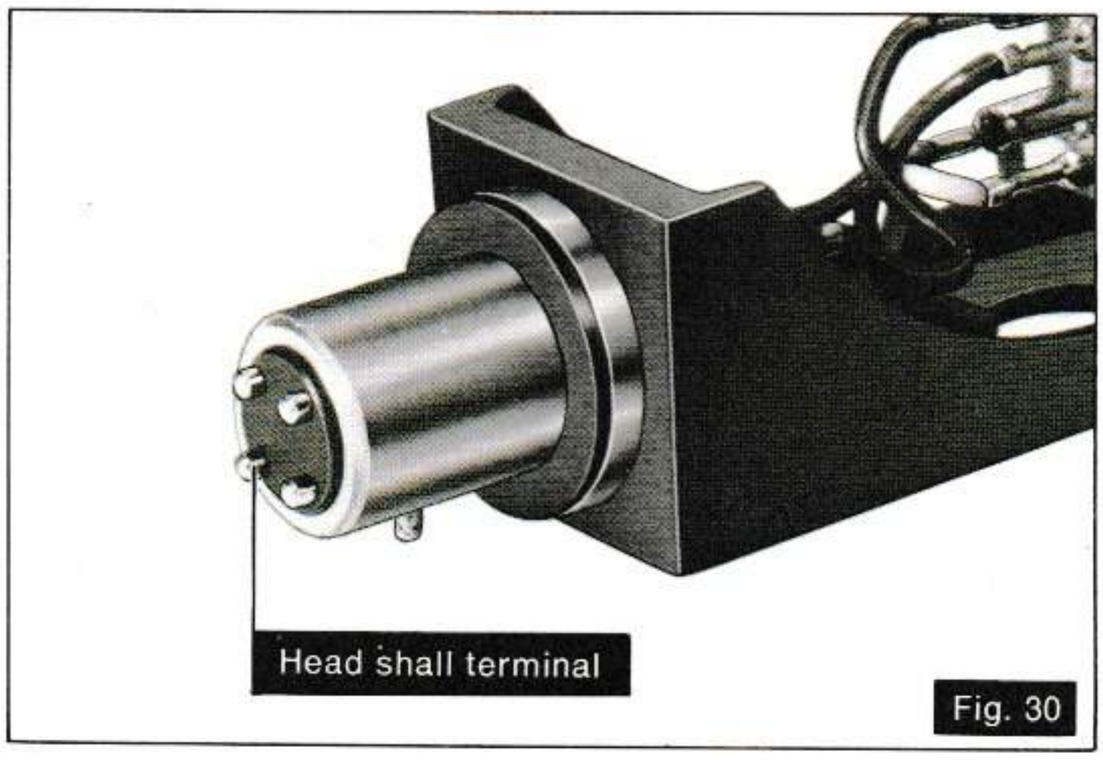


Fig. 30

❾**When finished playing, be sure to secure the tonearm by the arm clamp.**
After finished playing, if the unit is not to be used for some time, care should be taken to secure the tonearm for the protection of the stylus tip.
For the same reason, the stylus cover should also be attached.

❿**Wipe the dust cover and turntable base with a soft, dry cloth.**
Never use any cleaners containing alcohol, benzine or thinner. Use of a chemical dust cloth and the like should also be avoided. Be sure that the dust cover is not exposed to insecticide spray, as cracks or blurs may result.
To remove stubborn finger prints or grease spots detach the dust cover or disconnect the AC power plug and use a soft cloth damped with a mild soap and water solution.

⓫**Extra care should be taken in handling the turntable platter.**
The turntable platter has a rotor (the magnet of the motor) directly connected to it. Therefore, the turntable platter should not be removed from the motor shaft unnecessarily, since adhesion of dust or iron filings onto the magnet results in deterioration of the performance. Should it become necessary to remove the turntable platter, be sure to pull the AC power plug out of the socket.

Adjustment

❶**Adjustment of the arm lift height.** (See Figs. 31 and 32).
The arm lift height (distance between the stylus tip and record surface when cueing lever is raised) has been adjusted at the factory before shipping to approximately 15 to 18 mm. (In this case, cartridge height is 18 mm.)
If the clearance becomes too narrow or too wide because of the physical size of the different cartridges on the market, turn the adjustment screw clockwise or counterclockwise, at the same time pushing the arm lift down.
Clockwise rotation
—distance between the record and stylus tip is reduced.
Counterclockwise rotation
—distance between the record and stylus tip increases.

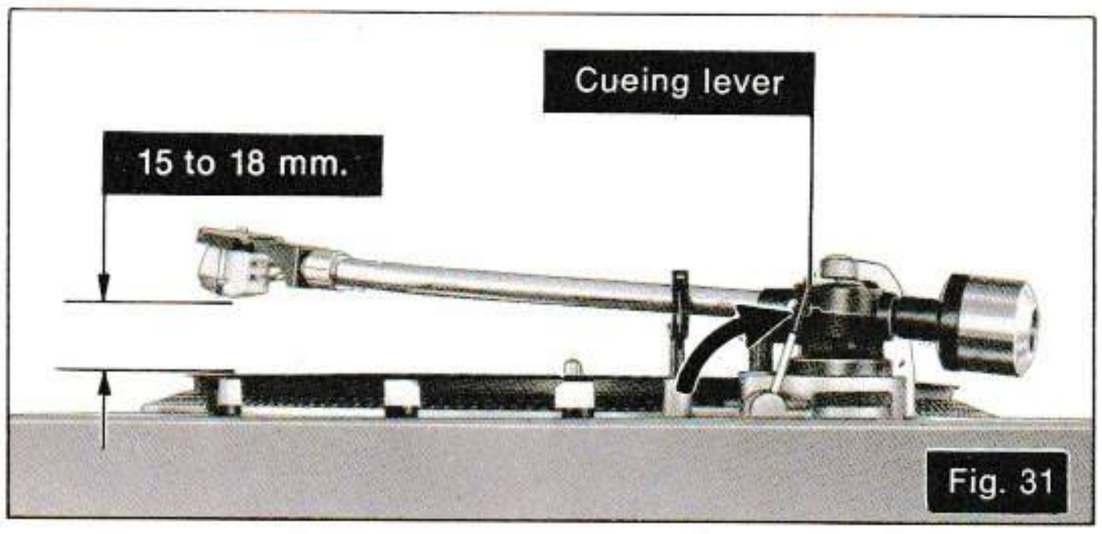


Fig. 31

Note:
As the adjusting screw has a hexagon head, be sure to make the adjustment while depressing the arm lift.

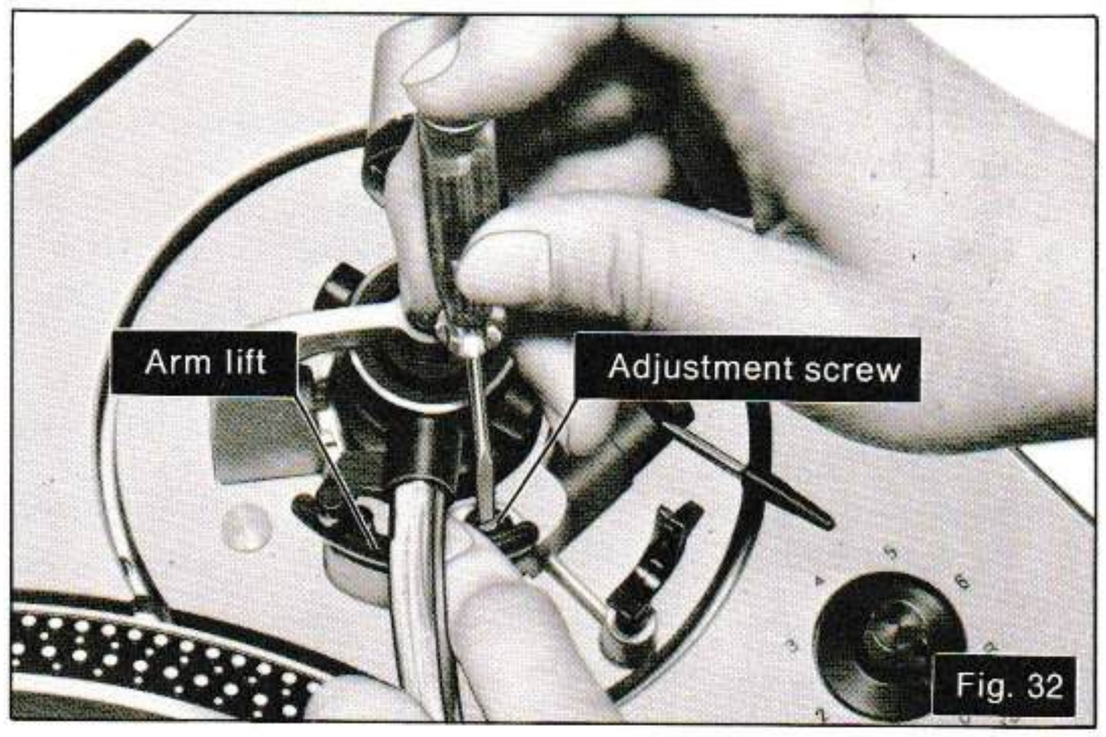


Fig. 32

❷**Adjustments for automatic start and automatic return positions.** (See Fig. 33).
Should the tonearm not function correctly, make adjustments according to the following procedures.

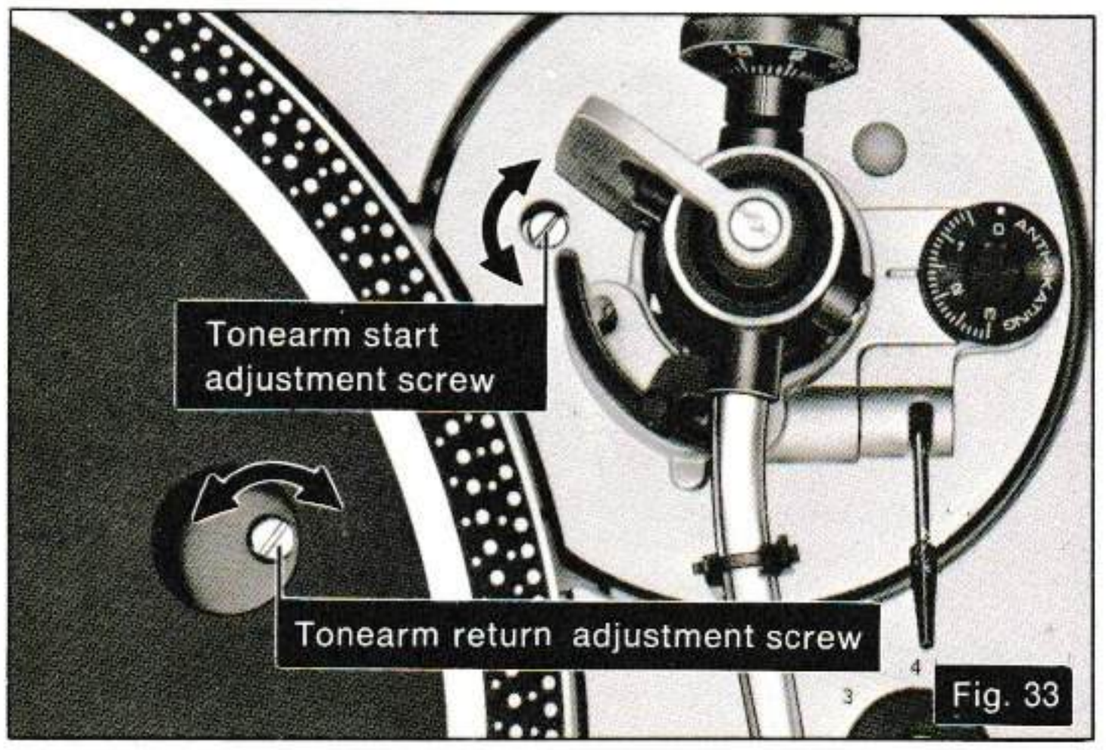


Fig. 33

Adjustment for automatic start position
(Remove the rubber cap.)
In cases where the stylus tip descends outside of the record
—Move clockwise.
In cases where the stylus tip descends onto halfway of a recorded piece
—Move counterclockwise.

Adjustment for automatic return position
(Remove turntable mat.)
In cases where the tonearm tends to return before the playing has finished
—Move clockwise.
In cases where the tonearm fails to return after the last groove of the record
—Move counterclockwise.

❸Speed adjustment (with pitch control knobs)
(See Figs. 34, 35 and 36)
Strobe dots are set on the tapered rim of the turntable platter according to the power frequency and the number of revolutions of the records. Make adjustment, referring to strobe dot indication. (See Fig. 34).

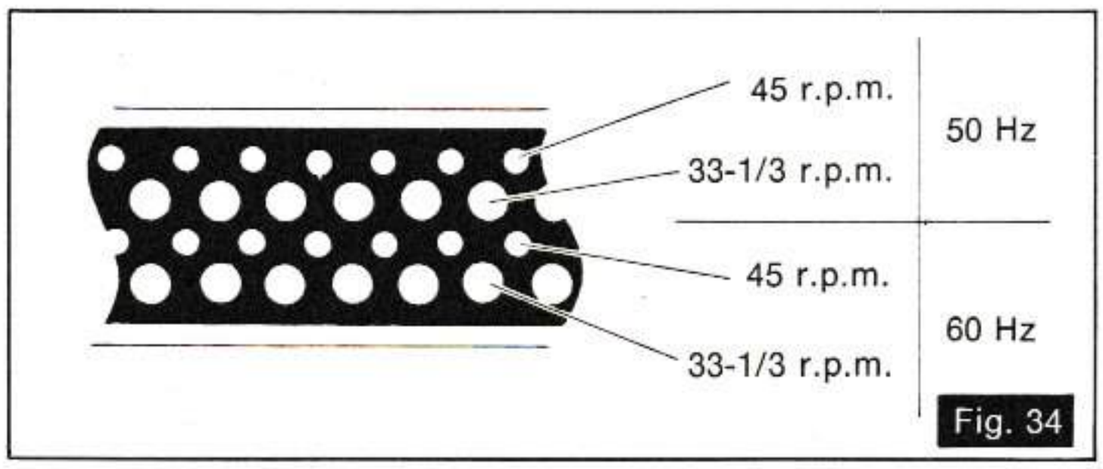


Fig. 34

① Set the speed selector to the number of revolutions to be adjusted. (See Fig. 35).
② Release the arm clamp and raise the coeing lever.
③ Move the tonearm to a slight extent towards the turntable platter. The strobe illuminator/pilot lamp will illuminate the strobe dots, and the turntable platter will rotate.
④ While turning the pitch control knobs either to "+" side or "−" side, adjust to such an extent that the strobe dots of the turntable platter look as if they were stationary, The state under which the strobe dots seem to be stationary represents the correct speed. (See Fig. 35).

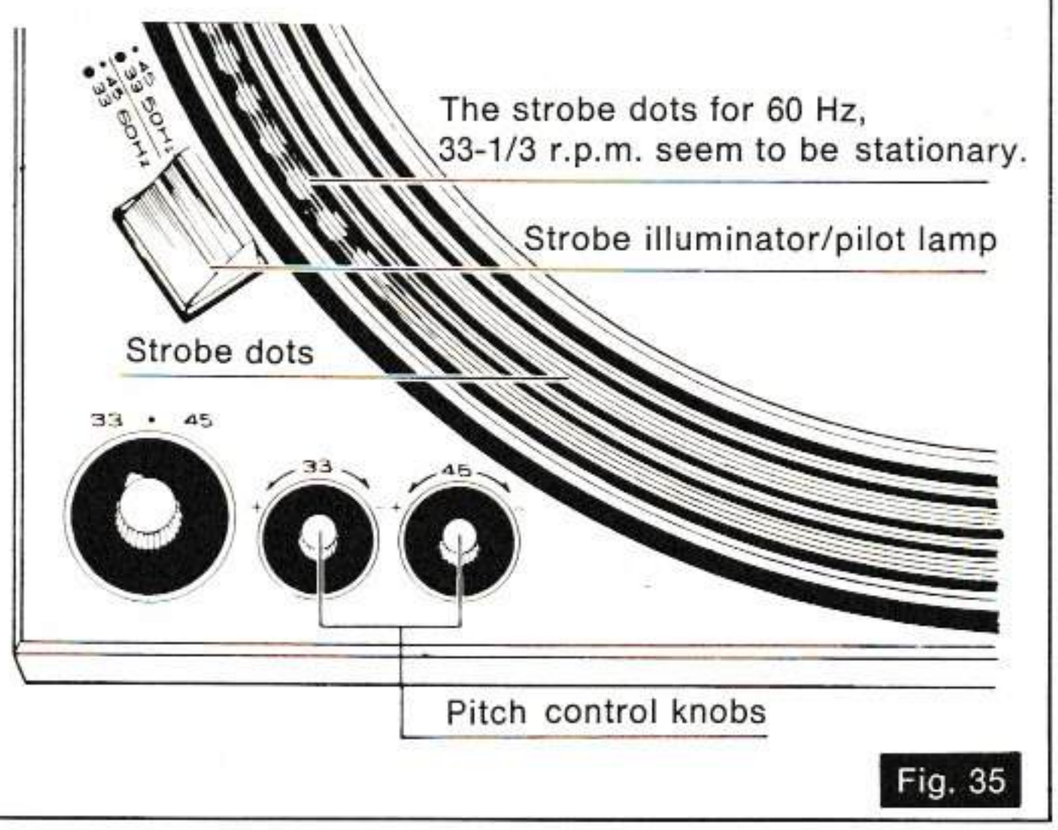


Fig. 35

"+" direction
This increases the speed of the turntable rotation, and the strobe dot pattern seems to flow in the same direction as the turntable platter.
"−" direction
This decreases the speed of the turntable rotation, resulting in a state opposite to that in the "+" direction.
Note:
Strobe dot pattern
The strobe illuminator/pilot lamp of this unit employs the commercially available power source. The frequency of such power source, when actually measured, has a fluctuation of about 0.2%. As such a fluctuation of the power source affects the strobe illuminator, the strobe dot pattern also seems to fluctuate to a certain extent. But the unit is not affected by the fluctuations of the power source, since a D.C. motor is employed.
⑤ If the desired speed can not be obtained by the variable pitch controls, turn the speed adjusting screws with a screw driver for further adjustments. (See Fig. 36).

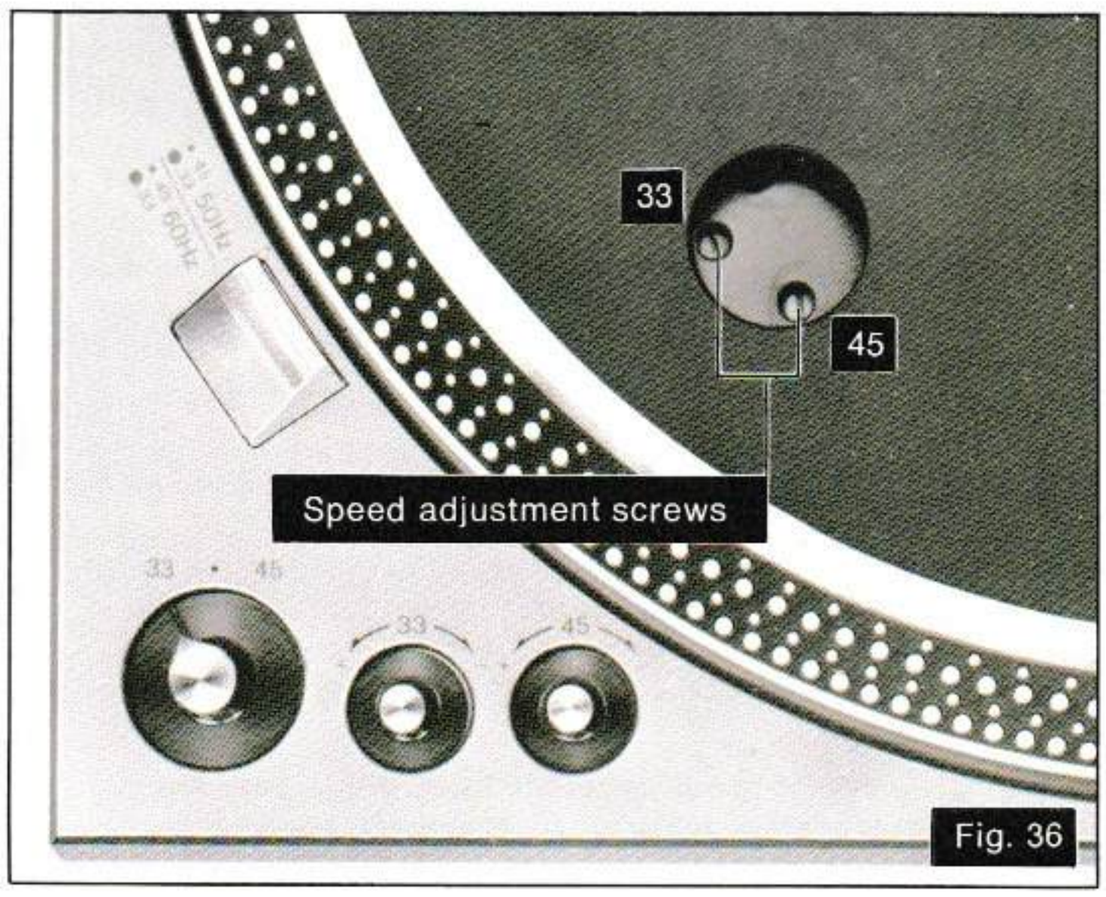


Fig. 36

Features

Turntable section

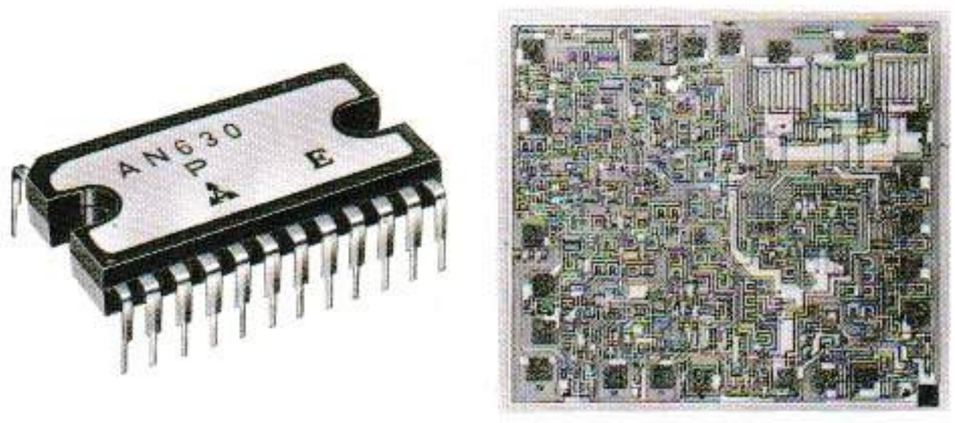
■High performance automatic turntable system which enables you to enjoy 6 fundamental operations.
The "memo-gram" function peculiar to Technics which enables you to enjoy the manual playing, auto-start, auto-return, auto-stop, repeated performance from 1 to 6 times and continuously repeated performance, and in addition, the multiple play capable of playing 1 to 6 records continuously. All these features will make your "audio life" still happier.

■Umbrella spindle of excellent performance.
A simple pipe of 7ø at a first glance.
The superior mechanism designing and excellent workmanship of Technics have been concentrated on this pipe playing an important part for the multiple play to constitute the highly reliable automatic mechanism by making the best use of the great deal of know-how obtained through actual production of automechanisms during the past many years.

■The newly developed double-insulate vibration-damping unit, unique in Technics, was developed through high mass design placing particular emphasis on acoustic quality. (See Fig. 37).
The turntable platter and the tonearm are installed on the base and solidly girded through the integral construction of the main base and the bottom of the case, while the entire base is floating in stable equilibrium with respect to the main turntable base through insulators, composed of metallic springs and a viscoelastic material.
The main turntable base is also provided with an insulator superior in vibration damping characteristics for protection from undesirable external vibrations. As a result, a combined effect is obtained through the use of two insulators to maintain excellent absorption and cut-off of external vibrations and local resonance from speaker output thus effecting remarkably improved feedback prevention.

■Motor construction peculiar to Technics in which the rotor of the motor is integrally connected to the turntable platter. (See Fig. 37).
In Technics turntable systems we took the lead in the world by putting the Direct Drive System on the market with a marked improvement in the performance of turntables. Since then, we have developed numerous turntables of high performance, furnishing new topics of conversation each time.
One of these achievements is the motor construction of this unit, unique and singular in the world, in which the rotor of the motor is directly connected to the turntable platter.
Moreover, the motor base has been integrally connected to the turntable base of diecast aluminum for presenting turntable systems of higher accuracy and rational construction.

■Dependable one chip IC. (See Fig. 38).
First development of the IC (AN630) of the Back Electromotive Force Frequency Generator system. The motor drive unit, control unit and various additional functions are integrated into the B.FG* system which utilize the Back Electromotive Force Frequency Generated in the drive winding of the Direct Drive motor.



One chip IC (AN 630)　　Interior of AN 630

Fig. 38

Cross section of motor portion and double insulator

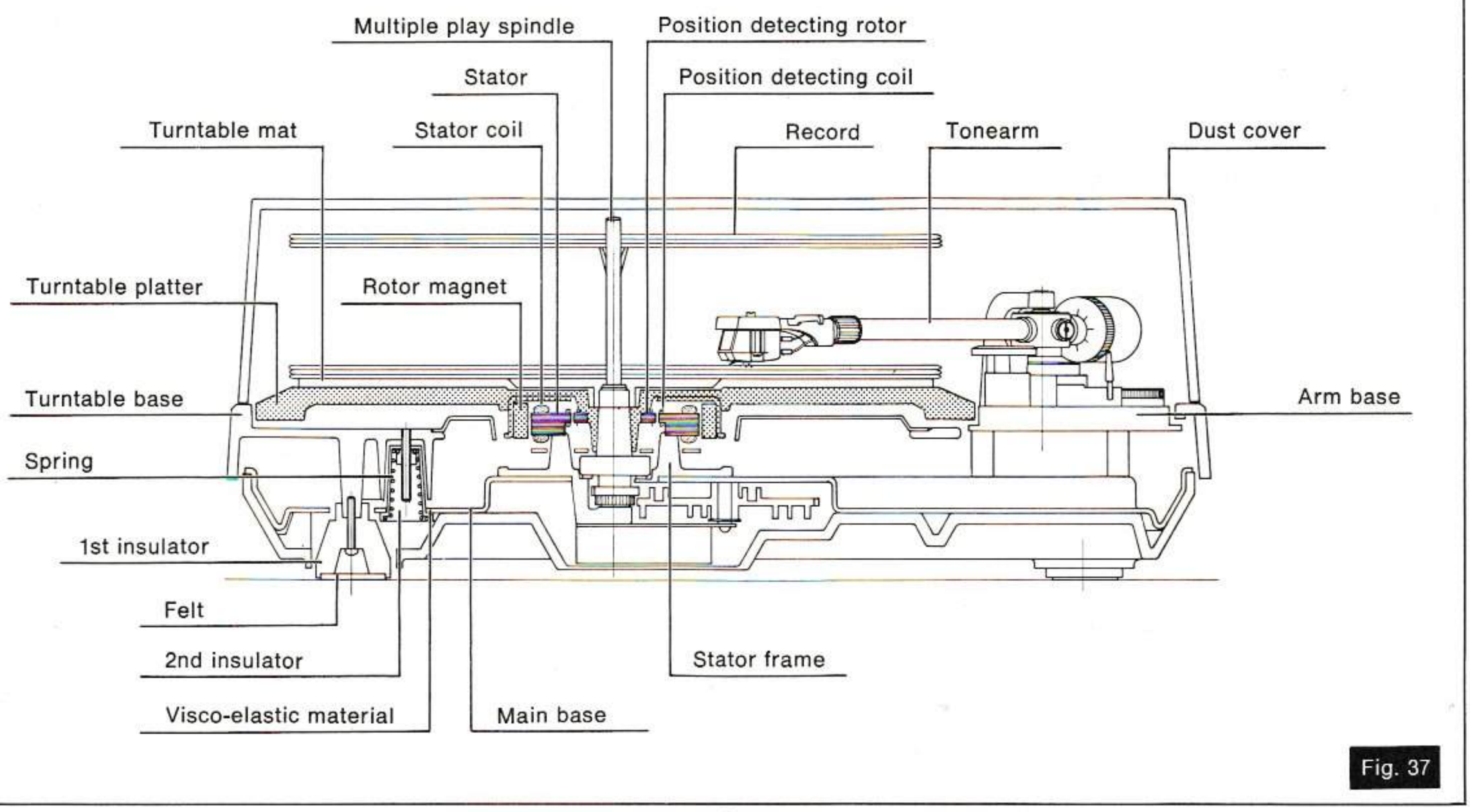


Fig. 37

Consequently, superior temperature, drift and transient characteristics are obtained improving the overall reliability of the turntable system.
The one chip IC (AN630) employed in this unit has a total of 321 elements such as transistors, diodes, resistors and capacitors consolidated in a silicon substrate approximately 3 ×2.7 mm^2 in size. We take pride in the fact that the one chip IC (AN630) represents the world's largest degrée of integration as a bipolar linear IC.
*Back Electromotive Force Frequency Generator

■**Hi-fidelity performance with rumble (signal to noise ratio) of −70 dB (DIN45539B), wow and flutter of 0.03% (W.R.M.S.).**
The ultra-low speed brushless DC motor employed in this unit has the extremely low power consumption of about 0.1 W, and is thus free from vibrations due to excessive energy or heat generation. The high performance of the Direct Drive motor is due to the efficiency of the newly developed double insulator and to the utilization of the one chip IC of the B.FG system.

■**Turntable base is of diecast aluminum.**

■**Prism type strobe illuminator also serves as pilot lamp.**

Tonearm section

■**Highly sensitive universal tonearm.**
Highly sensitive universal tonearm of the gimbal suspension system in which precision pivot bearings are employed at the horizontal and vertical journals of the tonearm has made it possible to realize arm friction of 7 mg. Therefore, the performance of the high-compliance cartridge can be fully realized.
Furthermore, the tonearm base is integrally formed with a die-cast zinc alloy finish of high specific gravity to lend sufficient strength and weight and thus completely eliminates undesirable vibrations.

■**Diecast aluminum head shell.**
The head shell integrally formed by strong diecast aluminum for reduction in weight is protected from harmful head shell resonance. Additionally, the head shell terminals are gold-plated for prevention of contact faults at replacement.

■**Viscous damped cueing.**
To prevent damage to the stylus tip and records liable to take place during operation of the tonearm, a cueing device damped with viscous oil is adopted.
Since the tonearm can be raised or lowered through operation of the lever, location of a desired playing portion or temporary suspension of the playing are conveniently achieved.

■**Anti-skating control.**
Proper outside force can be applied by such a simple operation as aligning the knob with the same value as the stylus pressure, thus cancelling the skating force harmful to the stylus tip.

■**Low-capacitance phono cables that will not impair the high-frequency characteristics of the cartridge.**

Specifications

General

Power supply	AC 120 V, 50 or 60 Hz
Power consumption	9 W
Dimensions (H ×W ×D)	17.5 ×45.3 ×36.5 cm (6- 7/8 ×17-12/16 ×14-3/8 inches)
Weight	9.1 kg (20 lbs.)

Turntable section

Type	Direct Drive Automatic Turntable System, Automatic start, Automatic return, Automatic shut-off, Multiple play with convenient "memo-gram" knob, Repeat play and Manual play
Drive method	Direct Drive
Motor	Back Electromotive Force Frequency Generator servo DC motor employing one chip IC
Turntable platter	Aluminum die-cast, 33 cm (13")
Turntable speeds	33-1/3 and 45 r.p.m.
Pitch controls	Individual adjustment controls, 10% adjustment range
Wow and flutter	0.03% W.R.M.S. (JIS C5521) ±0.042% Weighted zero to peak (DIN 45507)
Rumble	−70 dB (DIN 45539B) −50 dB (DIN 45539A)

Tonearm section

Type	Universal tubular arm, static-balanced type
Effective length	230 mm (9-1/16")
Overhang	15 mm (19/32")
Friction	7 mg (horizontally and vertically)
Effective mass	22 g (6.0 g cartridge weight 1.75 g stylus pressure)
Tracking error angle	Within +3° (at the point of 145 mm (5-45/64") from the center) Within +1° (at the point of 55 mm (2-3/16") from the center)
Offset angle	21.5°
Adjustable stylus pressure range	0 to 3 g (stylus pressure direct reading type)
Cartridge weight range	5 to 11 g
Head shell weight	9.5 g

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